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अनुभाग 6 एनालोग सिगनल स्विच परिपथ

Indian Standard

SEMICONDUCTOR DEVICES — INTEGRATED CIRCUITS

PART 5 ANALOGUE INTEGRATED CIRCUITS — ESSENTIAL RATINGS AND CHARACTERISTICS

Section 6 Analogue Signal Switching Circuits

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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CONTENTS

Page

1 SCOPE 1
2 REFERENCES 1
3 TERMINOLOGY 1
4 LETTER SYMBOLS 1
5 FUNCTIONAL SPECIFICATIONS 1
6 DESCRIPTION OF CIRCUIT 2
7 RATINGS (LIMITING VALUES) 2
8 RECOMMENDED OPERATING CONDITIONS 3
9 ELECTRICAL CHARACTERISTICS 3
10 MECHANICAL CHARACTERISTICS AND OTHER DATA 6
11 APPLICATION DATA 6

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Semiconductor Devices and Integrated Circuits Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

This standard is one of a series of standards on Integrated circuits. Other sections of this part are:

Section 1 General
Section 2 Operational amplifier
Section 3 Audio amplifier, video amplifier and multichannel amplifiers for telecommunication
Section 4 R. F. and I. F. amplifiers
Section 5 Voltage and current regulator

This standard is based on IEC publication 748-3 ‘ Semiconductor devices integrated circuits: Part 3 Analogue integrated circuits ’, issued by the International Electrotechnical Commission (IEC).

In reporting the results of measurements made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 ‘ Rules for rounding off numerical values (*revised*) ’.

Indian Standard

SEMICONDUCTOR DEVICES — INTEGRATED CIRCUITS

PART 5 ANALOGUE INTEGRATED CIRCUITS — ESSENTIAL RATINGS AND CHARACTERISTICS

Section 6 Analogue Signal Switching Circuits

1 SCOPE

This standard (Part 5/Section 6) gives ratings and characteristics that are required to specify integrated circuits in which certain terminals, designated switch output terminals, can be caused either to reproduce the signal at the designated switch input terminals, or to be isolated from them by application of suitable electrical control signal(s) to the control terminal(s). The integrated circuit package contains switching element(s) and the associated control circuit(s). The switching elements may be controlled by one or more inputs and the control input may be analogue (differential) or digital. Examples of analogue switching circuits are as follows:

1) Single analogue switching circuits having one switching element controlled by one control circuit.
2) Multiple-channel analogue switching circuits:
   a) In which the switches are independent and each switching element is controlled by its own separate control circuit.
   b) In which a group of analogue switching circuit is controlled by a single control circuit. The circuit may contain one or more groups of switching elements.
3) Multiplexing or demultiplexing analogue switching circuits having one or more analogue signal input terminals that can be selectively connected by a switch control circuit to one or more analogue signal output terminals.

It is possible that other types of analogue signal switching circuits will either be covered by this section or by others.

This standard covers both bipolar and FET switches.

This standard should not be used when the constituent parts of the circuit can be specified adequately by other existing sections of Publications on essential ratings and characteristics. For example, transistors that, while within the package, can be accessed separately via available terminations, should be specified separately according to the relevant specification.

2 REFERENCES

The Indian Standards listed below are necessary adjuncts to this standard:

IS No.	*Title*
1885 (Part 7/Sec 5) : 1971	Electrotechnical vocabulary: Part 7 Semiconductor devices, Section 5 Integrated circuits and microelectronics
3715 (Part 1) : 1971	Letter symbols for semiconductor devices: Part 1 General aspects (*first revision*)
5000 Series	Dimensions of semiconductor devices
12970 (Part 1) : 1990	Semiconductor devices — Intergated circuits: Part 1 General

3 TERMINOLOGY

For the purpose of this standard the terms and definitions given in IS 1885 (Part 7/Sec 5) : 1971 and provisions of 3 of IS 12970 (Part 1) : 1990 shall be applicable.

4 LETTER SYMBOLS

For the purpose of this standard the letter symbols given in IS 3715 (Part 1) : 1971 shall be applicable.

5 FUNCTIONAL SPECIFICATIONS

5.1 Block Diagram

A block diagram or equivalent circuit information of the analogue signal switching circuit should be given. The block diagram should identify the function of each external connection, so that no ambiguity can arise, and can also show the terminal numbers. If the encapsulation has metallic parts, any connection to them from external terminals should be indicated. The connections with any associated external electrical elements should be stated, where necessary.

As additional information, the complete electrical diagram can be reproduced, but not necessarily with indications of the values of the circuit components. The following terminals may be distinguished (*see* Fig. 1):

a) Supply terminals, that is, terminals intended to be connected to the power supplies,

b) Switch input and output terminals, that is, terminals into or out of which analogue signals are intended to be switched,

c) Control input terminals, that is, terminals into which (generally digital) control signals are applied. These control signals are intended to switch the analogue signal paths ON and OFF,

d) References terminals, and

e) Blank terminals.

5.2 Functional Description

The function performed by the circuit shall be specified. Where appropriate, a function table should be included.

5.3 Electrical Compatibility

It should be stated whether the device is electrically compatible with other devices or families of devices if it has digital control part.

6 DESCRIPTION OF CIRCUIT

6.1 Technology

The technology used in manufacture should be stated, for example, semiconductor monolithic integrated circuit, thin film integrated circuit, hybrid integrated circuit, micro-assembly, etc.

6.2 Details of Outline and Encapsulation

6.2.1 Where applicable reference to standard outlines and bases (*see* IS 5000 series), or outlines and base drawing showing dimension and tolerances should be given.

6.2.2 *Method of Encapsulation*

7 RATINGS (LIMITING VALUES)

7.0 In satisfying the following clauses, if maximum and/or minimum values are quoted, the manufacturer shall indicate whether he refers to the absolute magnitude or to the algebraic value of the quantity.

The ratings given shall cover the operation of the integrated circuit over the specified range of operating temperatures. Where such ratings are temperature-dependent, this dependence should be indicated.

7.1 Electrical Limiting Values

7.1.1 *Power Supply Voltage(s)*

a) Maximum value(s) and polarities,

b) Maximum ripple on the supply voltage(s) (where appropriate),

c) Maximum values of transient of spurious signals from the supplies for a specified duration (where appropriate),

d) Maximum values of the voltage between any supply terminal and case or reference terminal, and

e) The sequence of the application of supply voltages (where appropriate).

7.1.2 *Power Supply Current(s)*

a) Maximum value(s) (where appropriate), and

b) Maximum value(s) for a specified duration (external fault conditions) (where appropriate).

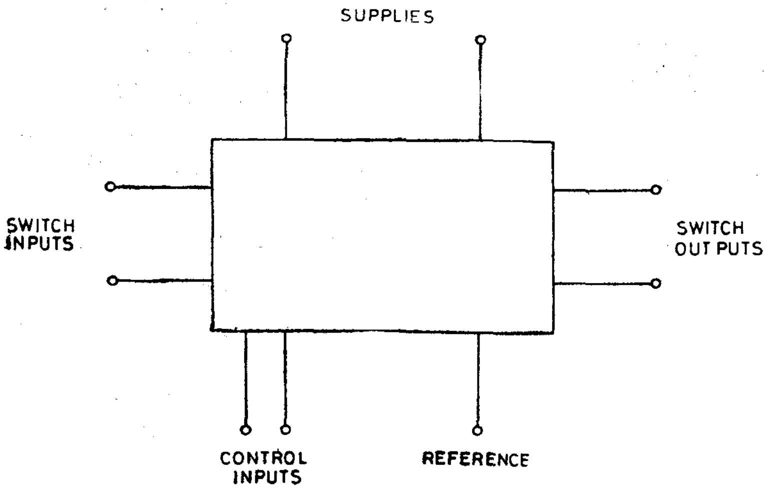

FIG. 1 BLOCK DIAGRAM OF ANALOGUE SIGNAL SWITCHING CIRCUIT

7.1.3 *Input Voltages (Switch Inputs and Control Inputs)*

a) Maximum values, with respect to the reference terminals (and polarities, if appropriate);

b) Maximum value between input terminals (where appropriate); and

c) Maximum value of two connected inputs with respect to a reference terminal (where appropriate).

7.1.4 *Output Voltages (Where Appropriate)*

a) Maximum values with respect to the reference terminal,

b) Maximum value between output terminals (where appropriate), and

c) Maximum value for two connected ouputs with respect to the reference terminal (where appropriate).

7.1.5 *Input Currents (Where Appropriate) (Switch Inputs and Control Inputs)*

Maximum values.

7.1.6 *Output Currents (Where Appropriate; See Note)*

Maximum values.

NOTE — The switch output current may, by nature of the configuration, be equal to the switch input current.

7.1.7 *Impedances (Where Appropriate)*

Minimum value of load impedance.

7.1.8 *Short-Circuit Duration (Between Terminals, or Between a Terminal and the Reference Terminal)*

Maximum value (Where Appropriate).

7.1.9 *Inter-Terminal Voltages (Where Appropriate)*

Maximum values.

7.2 Temperatures

7.2.1 *Operating Temperatures*

Minimum and maximum values or ambient of reference-point temperature.

7.2.2 *Storage Temperatures*

Minimum and maximum values.

7.2.3 *Terminal Temperature*

Maximum value of terminal temperature and maximum duration for which it may be applied.

7.3 Power Dissipation

a) Maximum total power dissipation as a function of temperature over the ambient or reference-point operating temperature range, and

b) Maximum power dissipation for each accessible circuit (including switching elements) independently.

8 RECOMMENDED OPERATING CONDITIONS

8.0 The recommended operating conditions given in **8.2** to **8.7** apply over the operating temperature range given in **8.1**.

8.1 Operating Temperature Range

Recommended ambient or reference-point temperature range.

8.2 Power Supplies

8.2.1 Polarity, nominal values and tolerances for voltages provided by the power supplies.

8.2.2 Polarity, nominal values and tolerances for currents provided by the power supplies (where appropriate).

8.2.3 Maximum value(s) of the impedance(s) of the power supplies (where appropriate).

8.3 Switch Input Terminals

Recommended range of voltages and/or currents of the input signal and/or, where applicable, bias conditions applied to the input terminals.

8.4 Switch-Output Terminals

Recommended load impedance (where appropriate). Recommended bias conditions (where appropriate).

8.5 Control Input Terminals

Recommended range of the voltage and/or current(s) of the control signal and, where appropriate, of the control signal source impedance, and/or bias conditions applied to the control input terminals.

8.6 External Elements (Where Appropriate)

Value(s) and tolerance(s) for the external elements that must be associated with the circuit.

8.7 Repetition Rate of Control Signals (Where Appropriate)

Maximum value for specified value of:

— supply voltage(s), and

— characteristics of control signal(s).

9 ELECTRICAL CHARACTERISTICS

9.1 Characteristics at Ambient or Reference — Point Temperature of 25°C

9.1.1 *Supply Currents*

Maximum values for specified values of:

- — supply voltage(s),
- — load conditions (where appropriate),
- — dynamic condition (where appropriate), for example, operating frequency, duty cycle (*see* Note), and
- — input voltage (where appropriate).

NOTE — If the supply current of the circuit is highly dependent on the dynamic conditions (for example, CMOS circuit), information on this dependency should be given.

9.1.2 *Characteristics of Control Inputs*

9.1.2.1 *Input impedance (where appropriate)*

Minimum value for specified values of:

- — supply voltage(s),
- — output voltage or current (as appropriate),
- — load impedance (where appropriate),
- — input signal amplitude, and
- — frequency of measurement.

9.1.2.2 *High-level input voltage(s)*

Least positive (most negative) value for specfied values of:

- — supply voltage(s),
- — other input voltages (where appropriate), and
- — load impedance (where appropriate).

9.1.2.3 *Low-level input voltage(s)*

Most positive (least negative) value for specified values of:

- — supply voltage(s),
- — other input voltages (where appropriate), and
- — load impedance (where appropriate).

9.1.2.4 *High level input current(s)*

Maximum value(s) for specified values of:

- — supply voltage(s),
- — input voltage(s),
- — load impedance (where appropriate), and
- — other input voltages (where appropriate),

9.1.2.5 *Low level input currents*

Maximum value(s) for specified values of:

- — supply voltage(s),
- — input voltages,
- — load impedance (where appropriate), and
- — other input voltages (where appropriate).

9.1.2.6 *Control input capacitance (where appropriate)*

Maximum value for specified values of:

- — supply voltage(s),
- — control input voltages,
- — frequency of measurement, and
- — other control voltages (where appropriate).

9.1.2.7 *Input offset voltage (where appropriate)*

Maximum value for specified values of:

- — supply voltage,
- — output voltage or current (as appropriate),
- — source resistance (where appropriate), and
- — common-mode input voltage.

9.1.2.8 *Input offset current (where appropriate)*

Maximum value for specified values of:

- — supply voltage,
- — output voltage or current (as appropriate),
- — common-mode input voltage (where appropriate), and
- — differential input voltage (where appropriate).

9.1.2.9 *Differential-input voltage range (where appropriate)*

Minimum value for specified values of:

- — supply voltage(s),
- — load impedance (where appropriate),
- — output voltage or current (as appropriate), and
- — reference voltage (where appropriate).

9.1.2.10 *dc input voltage range or common mode input voltage range (as appropriate)*

Minimum value for specified values of:

- — supply voltage(s), and
- — output voltage or current (where appropriate).

9.1.2.11 *Average bias current (differential input (where appropriate)*

Maximum value for specified values of:

- — supply valtage(s),
- — common-mode input voltage, and
- — differential input voltage.

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Telephone

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg
NEW DELHI 110002
331 01 31
331 13 75

Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola
CALCUTTA 700054
37 84 99, 37 85 61
37 86 26, 37 86 62

Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036
53 38 43, 53 16 40
53 23 84

Southern : C. I. T. Campus, IV Cross Road, MADRAS 600113
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